

**NATURAL RESOURCES CONSERVATION SERVICE**  
**Wyoming**  
**CONSTRUCTION SPECIFICATIONS**  
**FOR**  
**LINED WATERWAY OR OUTLET**  
**(CONCRETE LINING)**

---

(Owner/Operator)

---

(Project Title)

## GENERAL

Installation shall be in accordance with an approved design and plan. Details of construction shown on the drawings but not included herein are considered as a part of this specification. Construction activities shall be in accordance with applicable OSHA regulations.

## FOUNDATION PREPARATION

The foundation area for the lining shall be cleared of all trees, weeds, roots, sod, loose rock or other materials not suitable for the subgrade. Cleared material shall be disposed of as shown on the drawings.

The waterway shall be shaped to the cross section shown on the drawings. Fill materials shall be free of brush, roots, sod, large rocks or other material not suited for making compacted fills. The moisture content and methods of placing the material shall be such that a firm, stable fill will result. The fill materials shall be placed in horizontal lifts of such thickness that compaction density of fills is similar to adjacent undisturbed earth materials. However, prior to compaction the thickness of individual layers being compacted by mechanical equipment shall not exceed 8 inches.

## CONCRETE

Concrete shall be proportioned so that it is plastic enough for thorough consolidation and stiff enough to stay in place on the side slope of the ditch.

Concrete compressive strength shall be at least 3000 psi at 28 days. The mix design shall be in accordance with ASTM C 94 and this specification. The concrete shall be proportioned to include not less than 5 sacks cement per cubic yard of concrete when a water reducing admixture is used, except fly ash may be used as substitution for not greater than 20 percent of the Portland cement.

Certification of concrete. Ready-mix suppliers shall furnish mix design and concrete cylinder test break data for Technician approval prior to placement.

At the discretion of the responsible Technician, any concrete being used on a lining project shall be subject to sampling and testing in accordance with ASTM C 31 and C 39. Should the test results show that the average 28 day compressive strength of three cylinder specimens is less than 3000 psi, the job shall not be accepted as meeting specifications.

Cement shall be low alkali Type II or IIA Portland cement unless otherwise specified.

Fly ash shall conform to requirements of ASTM C 618 as applicable.

Water reducing admixtures shall be Type "A" meeting the requirements of ASTM C 494.

Coarse aggregate shall be maximum size of 1-1/2 inches per designations in ASTM C 33.

Air entrainment conforming to the requirements of ASTM C 260, shall be used. The air content shall be 5 to 7 percent.

Concrete slump conducted in accordance with ASTM C 143 shall not exceed 3 inches.

### CONCRETE PLACEMENT

Concrete for linings shall be placed on moist, compacted surfaces free from debris, loose soil, mud, frozen ground or standing water. The foundation shall be moistened to a depth of at least 1/2-inch.

### FINISHING AND CURING

All concrete linings shall have a smooth and uniform finish and shall be free of honeycombed or sandstreaked areas.

A concrete curing compound shall be applied to the concrete surface immediately after placing and/or finishing. The sealing compound shall meet or exceed the requirements of ASTM C 309 and shall be Type 1-D, clear with fugitive dye or Type 2, White pigment. The sealing compound shall be applied at a minimum rate of 1 gallon per 200 square feet of surface area. The sealing compound shall be applied in a manner that will insure a continuous, uniform coverage of membrane film over the entire surface of the exposed concrete in the ditch.

In lieu of applying a curing compound, water curing by ponding water in the lined ditch for a minimum of 5 days is acceptable.

Excessive shrinkage cracks that develop prior to final inspection shall make the

concrete lining unacceptable per these specifications, such concrete shall be removed and replaced.

When it appears that temperatures of less than 32 degrees Fahrenheit may occur within three days after placing of the lining, one of the following actions shall be taken:

1. Cover the entire length of the lining with 6 mil black plastic, making sure to restrict any air movement under the covering by blocking the ends.
2. Cover the entire length of lining with a minimum of 6 inches of straw.
3. Pond water in the waterway to its maximum capacity.

Concrete damaged by freezing shall be considered as not meeting these specifications and must be removed and replaced.

The use of accelerators or antifreeze compounds will not be allowed.

### CONTRACTION & CONSTRUCTION JOINTS

Contraction joints, at least 1/4 inch wide, shall be cut transversely in the freshly placed concrete to a depth of 1/3 the thickness of the lining at an average spacing of not greater than 10 feet. The maximum contraction joint spacing shall not exceed 11 feet. Construction joints shall be butt type, formed square with the lining surface and at right angles to the centerline of the ditch. Contraction and construction joints shall be tooled so that the edges have a smooth finish. It is recommended that all joints be filled with a sealer conforming to the requirements of ASTM D 1850.

#### CLEAN-UP

After construction the site shall be cleared of all unused materials.

#### ADDITIONAL SPECIFICATIONS